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occurring in Costa Rica (*Pittier* 7504). For the present I cannot say what species he has so determined; it is scarcely a *Stigmatopteris*.

Up to the present time *S. cyclocolpa* and *S. prasina* are the only species of the genus known which are fully bipinnate with pinnatifid pinnulae. Even the very large *S. contracta* (Christ) C. Chr. is bipinnatifid only, with the large segments again deeply incised.

COPENHAGEN, May, 1914.

Preliminary list of the ferns of the coast region of South Carolina north of Charleston*

LAURA M. BRAGG

The present paper is based on records from the Charleston Museum's plant survey of South Carolina. This survey aims to record for each species in South Carolina, (1) all published references to occurrence within the state, (2) data relative to herbarium specimens collected within the state, and, (3) the distribution of species as indicated by collecting and ecological study in different sections of the state.

For this summary of the ferns of the coast region north of Charleston the published sources have been John Bachman's Catalogue of phaenogamous plants and ferns, native or naturalized, found growing in the vicinity of Charleston, South Carolina, 1834; Henry W. Ravenel's Catalogue of the natural orders of plants inhabiting the vicinity of the Santee Canal, S. C.;† Lewis R. Gibbes' Botany of Edings' Bay;‡ W. C. Coker's three

*Reprinted with the addition of several paragraphs, and some modifications of the synonymy from the Bulletin of the Charleston Museum 10: 17-22. Feb. 1914.

† *Proc. Amer. Assoc. Adv. Sci.*, 2-17. 1830,

‡ *Proc. Ell. Soc.*, I, Oct., 241-248. 1857,

papers, The garden of André Michaux,* Observations on the flora of the Isle of Palms,† Plant life of Hartsville, S. C., 1912; and R. M. Harper's A midsummer journey through the coastal plain of the Carolinas and Virginia.‡

The herbaria consulted have been the Gray Herbarium, and those of the New York Botanical Garden, the University of Nebraska, Clemson College, and the Charleston Museum. Citations of specimens in the latter are marked (H), and refer chiefly to Ravenel's herbarium from the vicinity of the Santee Canal, upon which his Catalogue is based, and to specimens of my own collecting within the last four years. A few specimens are from Francis Peyre Porcher.

Further records are from the survey, based on my personal observations.

The region treated is restricted to that portion of the coastal plain of South Carolina which lies north of Charleston. Systematic collecting has been done at only a few localities, principally in the vicinity of Charleston and north to the Santee River, in what are now Charleston and Berkeley Counties. This is the classic ground worked by Bachman, Ravenel, and Porcher; Bachman about Charleston, and Ravenel and Porcher in the parishes of St. John's Berkeley and St. Stephen's, on the north and south sides respectively of the Santee canal. Since their day but little botanical work had been done in this region until the Charleston Museum a few years ago started its plant survey of the state. My own records for localities outside of Charleston and Berkeley Counties have been made during two short trips, one to Sumter and Stateburg, June 22-24, 1912; and the other to Chicora Wood on the Pee Dee River, about fourteen miles north of Georgetown, March 21-

* *Jour. Elisha Mitchell Scientific Soc.*, 27: 65-72. July, 1911.

† *Torreya*, 5: 135-145. Aug., 1905.

‡ *Bull. Torrey Botanical Club*, 36: 351-377. 1907.

26, 1913. As ferns were the object of neither trip, I find only a few specimens included among my notes and collections. The flora of the extreme inner edge of the coastal plain has been studied by Prof. Coker at Harts-ville. He lists twelve species of which all but *Lycopodium adpressum* have been found common in the lower coastal region.

The total number of species listed is thirty, five of which are from Bachman's Catalogue, unsubstantiated by specimens and possibly erroneous. Six species which the manuals credit to South Carolina should be looked for in the coast region, namely, *Ophioglossum vulgatum* L., *Botrychium biternatum* (Lam.) Underw., *B. obliquum* Muhl., *Asplenium dentatum* L., *Lycopodium lucidulum* Michx, and *Selaginella acanthonota* Underw.

Several species usually found on limestone rocks, which are recorded by Bachman only, may again be found on some of the lime marl outcrops of the Ashley and Cooper Rivers. Since Bachman wrote, most of these have been worked for phosphate rock, causing the removal of surface lime. Careful and more extended search will probably reveal northern species in the counties bordering on North Carolina, while southern species are likely to be found in the vicinity of Beaufort. *Dryopteris floridana* (Hook.) Kuntze, now first recorded for South Carolina, is probably only one of several extra-limital southern species which might be found in the coastal plain of the state.

The nomenclature here followed is that of the second edition of Small's Flora of the Southeastern United States.

I wish to express my thanks to Miss Margaret Slosson and Dr. B. L. Robinson. Dr. Robinson has most generously furnished me with data for over six hundred specimens of South Carolina plants in the Gray Herbarium, including pteridophytes.

OPHIOGLOSSUM CROTALOPHOROIDES Walt. ADDER'S-TONGUE. Light soil in pine woods.

Records. Bachman: Charleston. Ravenel: Santee Canal (H).

BOTRYCHIUM VIRGINIANUM (L.) Sw. RATTLESNAKE FERN. This species is probably common but the older herbaria have preserved no specimens of it. Bachman lists it for Charleston and Ravenel doubtless refers to it as one of his two species of *Botrychium*, *Ophioglossum crotalophoroides* from his herbarium being the other. Miss Mabel Webber and I found it fairly common at Otranto, in low mixed woods bordering the swamp to the west of the railroad. On April 27, 1913, the spores had fallen.

Records. Bachman: Charleston. Webber and Bragg: Otranto (H).

OSMUNDA CINNAMOMEA L. CINNAMON FERN. Common and abundant on the mainland in wet woods and borders of swamps; occasional in roadside ditches. Fiddleheads appear about the first week of March and mature spores may be found early in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Georgetown County, Otranto (H), Summerville, Sumter. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

OSMUNDA REGALIS L. ROYAL FERN. Common but less abundant than *O. cinnamomea*, with which it is usually associated. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Ten Mile. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

POLYPODIUM VULGARE L. COMMON POLYPODY. Recorded by Bachman only and that possibly erroneously, as he fails to list the very common *P. polypodioides*.

POLYPODIUM POLYPODIOIDES (L.) A. S. Hitchcock. RESURRECTION FERN; GRAY POLYPODY. Common

throughout the coastal region on trunks and large branches of trees, particularly of live oaks. Occasionally found in sand at the base of trees and on old buildings, even on tile roofs. In mild seasons, such as 1913 and 1914, growth continues throughout the year and prothallia and young plants may be found in January. This and *Pteridium aquilinum* are the common ferns of the sandy coast islands; both are found throughout the state.

Records. Bragg: Cainhoy, Charleston, Ingleside, Isle of Palms (H), Otranto, Santee Swamp, Ten Mile. Coker: Hartsville, Isle of Palms. Porcher: St. Johns Berkeley (H). Ravenel: Santee Canal (H). Robinson: Summerville (Gray Herb.). Sinkler: Eutawville (H).

PTERIS MULTIFIDA Poir. A tradition persists in Charleston that the common introduced fern until recently determined as *Pteris serrulata* L. f. was brought here from Europe by the Huguenots, and it is often called the Huguenot or Mediterranean Fern. On the other hand, local students claim that Prof. Lewis R. Gibbes discovered it here in 1868 and determined it as *P. cretica*. The first reference to the occurrence of a naturalized *Pteris* in South Carolina appears in the *Proceedings of the Elliott Society**, where Professor Gibbes reports "an undetermined species of *Pteris*, found about a month since, in fruit, in Wentworth St., near the corner of Rutledge, growing on the brick foundation of a wooden house, on the south side of the street. * * * the fern is growing freely, and it is like none of those known to inhabit this state. Its origin and the time of its introduction are unknown." No further reference to the discovery is made in the Elliott Society's *Proceedings*, and no specimens of an introduced *Pteris* from Professor Gibbes' herbarium have been traced. Professor

* II Dec., 1868, 61-62.

Gibbes' daughter, Miss Emma Gibbes, tells me that her father transplanted several of the ferns from Wentworth Street to the wall of his laboratory at the College of Charleston. From here he permitted the collector, A. H. Curtis, several years later to take many specimens, which were distributed as *P. serrulata*. J. Donnell Smith also collected here April 16, 1880 (Gray Herb.). Since then the fern has become abundant on the many shaded old brick walls of the city. Modern progress is its enemy and the advent of fresh paint and plaster mark its retreat. It is, however, holding its own and has spread beyond the city. I have found it plentiful on a modern brick culvert at the Navy Yard, Dr. D. S. Martin has noted it on the Theological Seminary at Columbia since 1898 or 1900, and Miss Anna Sinkler has recently sent me specimens from "Eutaw," near Eutawville.

Miss Margaret Slosson has kindly examined for me the South Carolina specimens of this species in the herbarium of the New York Botanical Garden and finds, beside eight sheets from Curtis, one collected by Eggleston at Eutawville, on "Locks of Santee Canal." That Eutawville is fifteen miles from the Santee Canal is of little importance, but it is of interest to know that Eggleston, probably in the eighties, found this introduced species in Ravenel's own country. Ravenel's Catalogue was devoted exclusively to native plants, but his fern herbarium includes numerous foreign and cultivated species. Neither the herbarium nor his manuscript catalog of it contain any trace of our fern, as surely they must have, had it been near the Santee Canal previous to 1850. Ravenel, further, in 1882, in his List of the more common native and naturalized plants of South Carolina* gives only two species of *Pteris*,—"aquilina" and "cretica." The latter is surely a mistake for

* S. C. Board of Agriculture South Carolina, 351, 1883.

serrulata. Ravenel could not have failed to know of Professor Gibbs' discovery. He may, however, have examined only young specimens, which frequently lack the decurrent character of the leaf. Scarcely three years before the species was still undetermined, as Prof. D. C. Eaton wrote,* "I learn from Prof. Lewis R. Gibbs, that a *Pteris* has sowed itself and grown abundantly on the walls of the College of Charleston, S. C. It will be very interesting to know whether this is *Pteris cretica* or *Pteris serrulata*." Miss Gibbs, who was her father's amanuensis, tells me that he sent specimens to Professor Eaton for determination. Chapman includes the species in the supplement to the 1884 edition of his Flora as *P. serrulata* from Charleston. In the main text of Professor Gibbs' copy of this edition he has added *P. serrulata* in pencil to the given species of *Pteris*, but makes no mention of *cretica*.

Although the ferns have disappeared from the Wentworth Street house and the laboratory at the College of Charleston was taken down after the earthquake of 1886, there is no room to doubt that the present well-known *P. serrulata* L. f., or *P. multifida* Poir according to most recent synonymy, is the fern of Professor Gibbs' discovery and that the belief that *P. cretica* has ever been taken in Charleston is an illusion based on Ravenel's error.

The species is deciduous in Charleston; growth continues throughout the year, however, and young plants may be found in January. Spores mature in April.

PTERIDIUM AQUILINUM (L.) Kuhn. BRACKEN. Common throughout coast region, in open sandy woods. With scrub oaks this species forms the typical undergrowth where the pine barrens are frequently burned over. It is the only fern of the dry, lightly-wooded sea

* Bull. Torrey Bot. Club, 6: 307, 1879.

islands and is characteristic of the open grassy borders of the jungle on more densely covered islands. Spores mature in May.

The variety *pseudocaudatum* Clute is well represented by a specimen from the Santee country, collected by Ravenel and labeled by him *P. caudata*. Bachman's *P. caudata* must also, in all probability, be referred to this form. I have, however, searched extensively but unsuccessfully for a distinct variety in the vicinity of Charleston.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Dewees Island, Georgetown County, Isle of Palms, Otranto, Sullivan's Island, Summerville, Sumter. Coker: Hartsville, Isle of Palms, Ten Mile. Gibbes: Edings' Bay. Harper: "intermediate pine-barrens." Robinson: Charleston Navy Yard (Gray Herb.).

PELLAEA ATROPURPUREA (L.) Link. CLIFF BRAKE. Recorded by Bachman, probably erroneously.

ANCHISTEA VIRGINICA (L.) Presl. VIRGINIA CHAIN-FERN. Abundant in freshwater swamps and ditches and in low wet woods, associated with the Cinnamon Fern, Net-veined Chain-fern, and, in woods, with the Lady Fern and Florida Shield-fern.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Georgetown County, Summerville, Sumter. Coker: Hartsville, Ten Mile. Harper: "damp sandy places." Ravenel: Santee Canal.

ASPLENIUM PLATYNEURON (L.) Oakes. EBONY SPLEENWORT. One of the most common ferns. Associated with *Pteris serrulata* on old walls in Charleston. Grows luxuriantly on wooded banks, and particularly along artificial ditches. Fertile leaves measuring four to five inches wide and twenty inches long, with deeply serrate pinnae, are characteristic of highly developed plants. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston, Georgetown County, Ingleside, James Island, Otranto, Stateburg. Coker: Hartsville. Ravenel: Eutaw Springs, Santee Canal.

ASPLENIUM TRICHOMANES L. Recorded by Bachman only.

ASPLENIUM RUTA-MURARIA L. Recorded by Bachman only.

ATHYRIUM FILIX-FOEMINA (L.) Roth. LADY FERN. Frequent in rich damp woods. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Otranto. Coker: Hartsville. Ravenel: Santee Canal.

LORINSERIA AREOLATA (L.) Presl. NET-VEINED CHAIN-FERN. Very abundant in freshwater swamps and along the rice field canals.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Otranto, Georgetown County along rice lands of Pee Dee and Waccamaw Rivers, St. Andrews Parish (H), Sumter. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal (H).

ONOCLEA SENSIBILIS L. SENSITIVE FERN. Not common.

Records. Bachman: Charleston. Bragg: St. Andrews Parish (H). Ravenel: Santee Canal (H).

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. CHRISTMAS FERN. Common in dry mixed woods near the coast. At Stateburg found in a deep gorge. Brought into Charleston throughout the year by the negro women selling flowers.

Records. Bachman: Charleston. Bragg: Cainhoy, Otranto (H), Plantersville, Stateburg. Porcher: St. Johns Berkeley.

DRYOPTERIS NOVEBORACENSIS (L.) A. Gray. NEW YORK FERN. Recorded by Bachman, probably er-

roneously for *D. thelypteris*, a common species near Charleston.

DRYOPTERIS THELYPTERIS (L.) A. Gray. MARSH SHIELD-FERN. Common in wet woods.

Records. Bragg: Charleston Navy Yard (H). Coker: Isle of Palms.

DRYOPTERIS PATENS (Sw.) Kuntze. Several plants on an old brick tomb at Goose Creek Church, Otranto, are all that I have found. Dr. B. L. Robinson kindly determined the species for me. Chapman, in the third edition of his Flora, includes South Carolina in its range but Small does not.

Records. Bragg: Otranto (H). Ravenel: Eutaw Springs (Gray Herb.).

DRYOPTERIS FLORIDANA (Hook.) Kuntze. FLORIDA SHIELD-FERN. Not previously recorded for South Carolina. Abundant in several localities at the Charleston Navy Yard, growing in damp woods along streams running through the pine barrens. Associated in one particularly rich spot with the Cinnamon and Royal Ferns, both Chain-ferns, the Marsh Shield-fern, and within a few yards of the Lady Fern and *Selaginella apus*. The leaves are evergreen and in winter lie stretched on the ground in a circle, the fertile ones often over three feet in length. Spores mature in late May and early June.

Records. Bragg: Charleston Navy Yard (H).

DRYOPTERIS HEXAGONOPTERA (Michx.) C. Chr. BROAD BEECH-FERN.

Records. Bachman: Charleston. Porcher: St. Johns Berkeley (H).

PHEGOPTERIS PHEGOPTERIS (L.) Underw. LONG BEECHFERN. Recorded by Bachman, undoubtedly erroneously.

WOODSIA RUFIDULA Beck. Recorded by Bachman only. It is unlikely that a *Woodsia* should occur in this

region and I am unable to form any opinion regarding the species referred to.

AZOLLA CAROLINIANA Willd. FLOATING FERN. Floating in still water.

Records. Ravenel: Santee Canal (H).

LYCOPODIUM ADPRESSUM (Chapm.) Lloyd & Underwood. CLUB MOSS. Coker records this species as plentiful at Hartsville "in savannas and in slightly dryer situations than the preceding" (*L. alopecuroides* L.).

LYCOPODIUM ALOPECUROIDES L. FOX-TAIL CLUB MOSS. Common in damp pine land.

Records. Bragg: Georgetown County (H). Coker: Hartsville. Ravenel: Santee Canal (H).

LYCOPODIUM CAROLINIANUM L. LITTLE CLUB MOSS. In low pine barrens.

Records. Bachman: Charleston. Bragg: Summer-ville (H). Coker: Hartsville.

PSILOTUM NUDUM (L.) Griseb.

Records. Ravenel: Santee Canal (H).

SELAGINELLA APUS (L.) Spring. CREEPING SELAGIN-ELLA. Frequent but not abundant in shady places along the swampy margins of freshwater streams, growing in sand mixed with vegetable mold. Found throughout the year.

Records. Bragg: Charleston Navy Yard (H), Ot-ranto. Ravenel: Santee Canal (H).